Optimization and Simulation

Simulation Exercise 3: Statistical Analysis and Bootstrapping

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The Exercise: Statistical Analysis and Bootstrapping

- 3.1: Sample mean and sample variance
- 3.2: Bootstrapping
- 3.3: Get to know the Sioux Falls Network
- 3.4: Project 1: Analysis of the Sioux Falls Network

General Advice

- Call `clear` before running an experiment
  - Reloads all the modified function files
  - Erases all variables in memory

3.1 Sample Mean and Sample Variance

- Implement the function `UpdatedStatistics.m`
- Test your implementation with `UpdatedStatisticsTest.m`

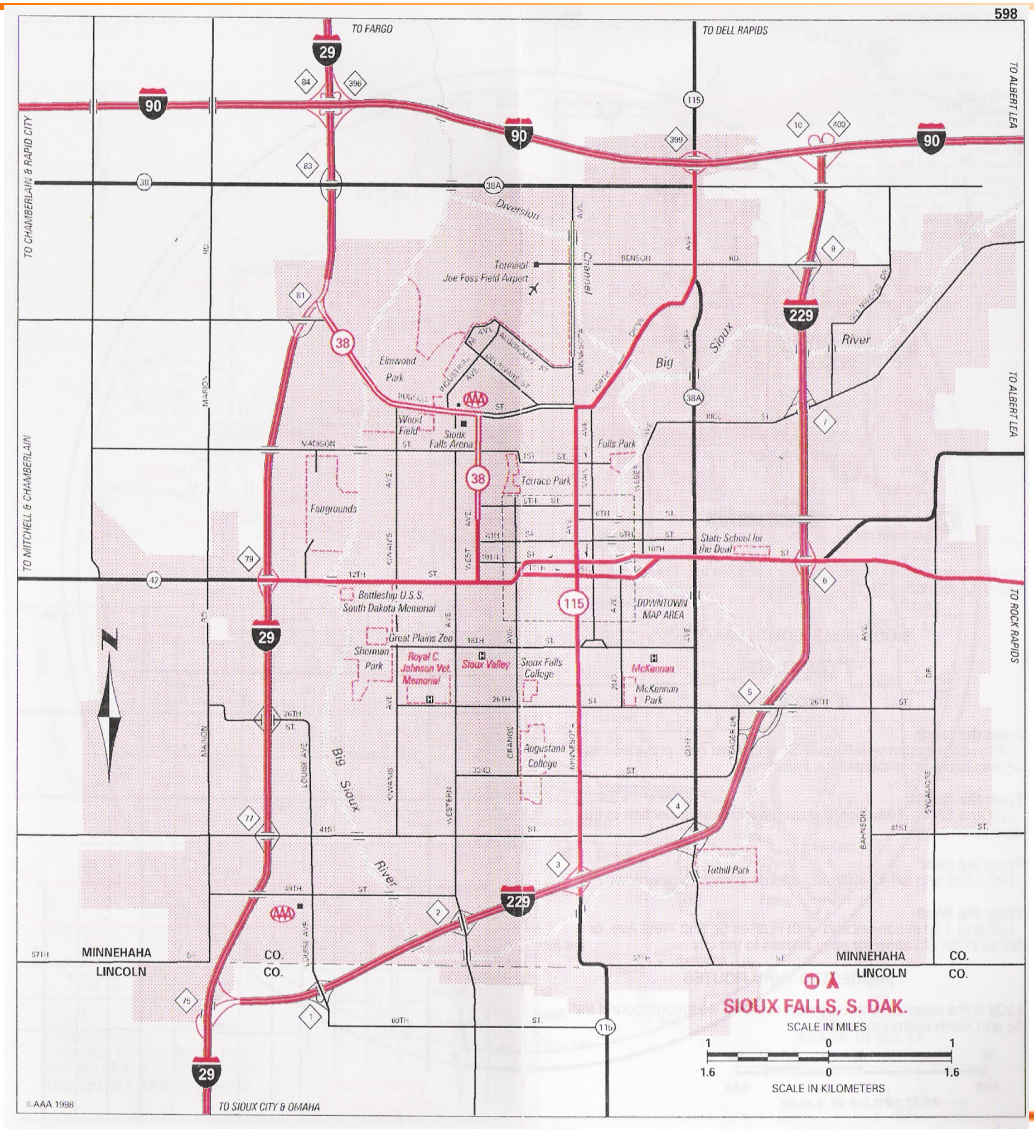
3.2 Bootstrapping

- Implement the function `BootstrapMSE.m`
- Test your implementation with `BootstrapMSETest.m`
- `help BootstrapMSE.m` describes the function

Transportation Network Test Problems

- http://www.bgu.ac.il/~bargera/tntp/

3.3 The Sioux Falls Network



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3.3 The Sioux Falls Network

3.3 Explore the Sioux Falls Network

- Load the Sioux Falls scenario with `NewSiouxFalls.m`
  - Use a scale if 0.0025 (functional parameter)
- Simulate with `QueueingSimulation2.m` from last class
- Analyze the results with `SiouxFallsAnalysis1.m`
  - What do the different plots show you?
  - Evolution of queue lengths on links
- The scenario is a very rough approximation of real data
  - Time [min]; demand and capacity [veh/min]

3.4 Project 1: Analyzing the Sioux Falls Network

- Gather statistics about the system's performance
  - Length of queues
    - On average (give MSE of your estimates)
    - Worst case (give bootstrap MSE of your estimates)
  - Find links that most likely generate spillback
    - spillback = congestion keeps vehicles from entering
    - `scenario.JOBLENGTH` is length of one vehicle
    - `scenario.{`x_1`,`y_1`,`x_2`,`y_2`}` defines link lengths
  - What capacities would you change to reduce spillback?
- Group specific questions will be communicated individually